High Yield Hints - Molecular genetics

1. ***Cistron*** is the smallest unit of DNA that transcribes a messenger RNA. ***Recon*** is the unit of recombination and ***Muton*** is the part of DNA that undergoes mutation.

2. ***B-DNA*** is the usual form of right handed DNA with 10 base pairs in one turn. A-DNA (11 base pairs), C-DNA (9 base pairs) and D-DNA (8 base pairs) are forms of DNA produced in experimental conditions. ***Z-DNA*** is the left handed DNA discovered by Rich, Nordheim and Wang in 1984. It has 12 base pairs per turn. ***Palindrome DNA*** has inverted repetition of base sequences. ***H-DNA*** contains inverted repetition of base sequences to form Triple helix DNA.

3. Watson, Crick, Wilkins and Rosalind Franklin are associated with the Double Helical model of DNA. There are 10 base pairs per turn in the DNA. The base pairs are separated by a distance of 3.4 Angstrom so the total length of the turn is 34 Angstroms. ***Hydrogen bonds*** in the DNA stabilize the topology and antiparallel nature of DNA. ***Phospho diester bonds*** maintain the polarity (3′-5′ and 5′-3′) of the DNA strands.

4. In ***Semi-conservative*** replication of DNA (proposed by Matthew, Mehelson and Stahl), two daughter DNA are formed each having a new and old strands. In ***Conservative replication***, the parent helix remains intact. In ***Dispersive replication***, all the four strands of two daughter DNA are mixture of parental and daughter DNA. ***Rolling circle model*** of DNA replication is proposed for the replication of Circular DNA of bacteria.

5. ***Helicase*** is the enzyme that separate DNA strands during replication. ***Topisomerase*** (Relaxing enzyme) reduces tension in the DNA during unwinding. DNA Polymerases I , II and III are DNA synthesizing enzymes. DNA polymerase III is the most active enzyme. Bacterial DNA Polymerases are Pol I and Pol II (DNA repair) and Pol III (Chromosome replication). ***Ligase*** (Molecular glue) joins DNA segments after synthesis. ***Telomerase*** is the enzyme containing RNA and protein. It terminates DNA replication. ***Reverse Transcriptase*** is the bacterial Polymerase that synthesise DNA from RNA. ***Primase*** (RNA polymerase) is used to synthesize Primer RNA during replication.
6. DNA replication occurs in the 5′-3′ direction because the DNA polymerase III can act only in this direction. ***"Leading strand"*** synthesis occurs in the 5′-3′direction. ***"Lagging strand"*** synthesis (Discontinuous synthesis) occurs as DNA segments called ***"Okasaki Fragments".*** This is because the second strand of DNA has 3′-5 direction and Polymerase III can act only in the 5′-3′ direction.

7. Beadle and Tatum conducted experiments in ***Neurospora crassa*** (Pink bread mold) to show the relation ship between genes and enzymes. Wild type Neurospora (Prototroph) grow in Minimal medium containing few salts and minerals. Mutant forms (Auxotroph) grow only when amino acids like Ornithine, Citrulline and Arginine are added to the culture. Beadle and Tatum conducted tetrad analysis in Neurospora and proposed the "One Gene One Enzyme" hypothesis.

8. ***RNA Splicing*** involves the removal of Introns (non coding sequences) from the m-RNA. Then the Exons (coding sequences) are joined together. ***RNA Editing*** is the modification of the m-RNA before translation. ***SnRNPs or Spurps*** are ribonucleoproteins binds to the m-RNA during RNA splicing. ***Spliceosomes*** are formed by the interaction of SnRNPs with other proteins. ***RNA capping*** is the process by which a guanine nucleotide (with methyl group) is added to the 5′ end of RNA after splicing. RNA cap determines the site of translation. ***PolyA tailing*** is

the process by which a long tail of Adenine residue is added to the 3′ end of m-RNA during splicing. ***Ribozymes*** are RNA molecules act as enzymes. RNase P is a Ribozyme.

9. ***Recombinant DNA technology*** involves manipulation of DNA which involves DNA cloning, DNA profiling etc. ***R-DNA*** or Recombinant DNA contains a bacterial plasmid and a desired gene sequence of another organism. ***Restriction enzymes*** are "Molecular Scissors" that cut double stranded DNA at specific sites producing 'Staggered ends'. These enzymes are present in bacteria to destroy foreign DNA such as Viral DNA. The enzyme will not destroy the own DNA of bacteria because it is kept in the methylated form. Most widely used restriction enzymes are Eco R1, Bam 1, Hind III etc.